P1 1187761

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office

June 29, 2004

THIS IS TO CERTIFY THAT ANNEXED HERETO IS A TRUE COPY FROM THE RECORDS OF THE UNITED STATES PATENT AND TRADEMARK OFFICE OF THOSE PAPERS OF THE BELOW IDENTIFIED PATENT APPLICATION THAT MET THE REQUIREMENTS TO BE GRANTED A FILING DATE.

APPLICATION NUMBER: *60/320,071*
FILING DATE: *March 31, 2003*
RELATED PCT APPLICATION NUMBER: *PCT/US04/09927*

By Authority of the
COMMISSIONER OF PATENTS AND TRADEMARKS

M. Tarver

M. TARVER
Certifying Officer

PRIORITY DOCUMENT
SUBMITTED OR TRANSMITTED IN COMPLIANCE WITH RULE 17.1(a) OR (b)

Electronic Filing System (EFS) Data
Electronic Patent Application Submission
USPTO Use Only

EFS ID:	25412
Application ID:	60320071
Title of Invention:	Unattended Spot Cleaning Apparatus
First Named Inventor:	Jonathan Miner
Domestic/Foreign Application:	Domestic Application
Filing Date:	null
Effective Receipt Date:	2003-03-31
Submission Type:	Provisional Application
Filing Type:	new-utility
Confirmation Number:	0
Attorney Docket Number:	71189-1470
Digital Certificate Holder:	cn=Joel Evan Bair, ou=Registered Attorneys, ou=Patent and Trademark Office, ou=Department of Commerce, o=U.S. Government, c=US
Certificate Message Digest:	dye+4/p2rjDAxBp91yPTZg==
Total Fees Authorized:	$160.0
Payment Category:	DA - Deposit Account
Deposit Account Number:	502003
Deposit Account Name:	Joel E. Bair

TRANSMITTAL FORM

Electronic Version 1.0.3

Stylesheet Version: 1.0

Submission Type: Provisional Application

Attorney Docket Number: 71189-1470

Unattended Spot Cleaning Apparatus

First Named Inventor: Jonathan L. Miner

SUBMITTED BY

Name:	Joel E. Bair
Registration Number:	33,356
Electronic Signature Mark: /s/ Joel E. Bair	Date Signed: 20030331

I certify that the use of this system is for OFFICIAL correspondence between patent applicants or their representatives and the USPTO. Fraudulent or other use besides the filing of official correspondence by authorized parties is strictly prohibited, and subject to a fine and/or imprisonment under applicable law.

I, the undersigned, certify that I have viewed a display of document(s) being electronically submitted to the United States Patent and Trademark Office, using either the USPTO provided style sheet or software, and that this is the document(s) I intend for initiation or further prosecution of a patent application noted in the submission. This document(s) will become part of the official electronic record at the USPTO.

Attached Files:

bibd-transmittal	71189-1470apds.xml
fee-transmittal	71189-1470fee.xml
specification	spec.xml

Comments:

FEE TRANSMITTAL

Electronic Version 1.1.0
Stylesheet Version: 1.0

Patent fees are subject to annual revisions on or about October 1st of each year.

Large Entity

TOTAL FEES AUTHORIZED: $ 160

The commissioner is hereby authorized to charge indicated processing and/or publication fees and credit any overpayments to:

Deposit Account Number:	50-2003	
Deposit Account Name:	McGarry Bair PC	

Charge Any Additional Fee Required Under 37 C.F.R. Sections 1.16 and 1.17.

Charge Assignment Fees Required Under 37 C.F.R. Section 1.21 (h).

SUBMITTED BY

Authorized Name:	Joel E. Bair
Electronic Signature Mark:	/s/ Joel E. Bair
Date Signed:	20030331

BASIC FILING FEE

Fee Description	Fee Code	Fee Paid
Provisional Filing Fee	1005	$ 160

Subtotal For Basic Filing Fee: $ 160

APP_ID=60320071

APPLICATION DATA SHEET

Electronic Version 0.0.11
Stylesheet Version: 1.0

Attorney Docket Number: 71189-1470

Publication Filing Type:	new-utility
Application Type:	utility
Title of Invention:	Unattended Spot Cleaning Apparatus

Customer Number Attorney: 20915

Customer Number Correspondence Address: 20915

INVENTOR(s):

Primary Citizenship:	US
Given Name:	Jonathan
Middle Name:	L.
Family Name:	Miner
Residence City:	Rockford
Residence State:	MI
Residence Country:	US
Address:	50 S. Lincoln Street
	Rockford MI, 49341 US

Primary Citizenship:	US
Given Name:	Eric
Middle Name:	C.
Family Name:	Huffman
Residence City:	Lowell
Residence State:	MI
Residence Country:	US
Address:	995 Flat River Drive
	Lowell MI, 49331 US

SPECIFICATION

Electronic Version 1.2.8
Stylesheet Version 1.0

Unattended Spot Cleaning Apparatus

Background of Invention

Field of the Invention

[0001] This invention relates to extraction cleaning devices. In one of its aspects, the invention relates to an extraction-cleaning machine that is adapted to clean spots in carpet and other fabric surfaces.

Description of the Related Art

[0002] U.S. Patent Application No. 09/755,724, published on December 6, 2001, discloses an upright deep cleaning extraction machine comprising a base movable across the surface to be cleaned, an upright handle pivotally attached to the base, a fluid distribution system, a recovery system and an agitation system. The fluid distribution system further comprises a clean solution tank, a delivery valve and a spray nozzle, each of which are in fluid communication via a conduit. Upon activation of the delivery valve, fluid is delivered under force of gravity through the spray nozzle and onto the surface being cleaned. A suction nozzle is located at a forward end of the base and provides an entry point for liquid extraction through a working air conduit and into a dirty water recovery tank. A vacuum motor driving a fan is positioned downstream of the recovery tank to create a working airflow. A rotating agitation brush is mounted horizontally in spaced relation behind the suction nozzle. The brush may be rotated via a belt driven by the vacuum motor or alternatively via an air driven turbine.

[0003] U.S. Patent No. 6,446,302 to Kasper et al. discloses an extraction cleaning machine with floor condition sensing devices and controllers for the cleaning

operation. A controller sends signals to a variable control cleaning system in response to signals received from the condition sensors. The condition sensors and controllers are mounted to an upright deep cleaner wherein movement of the cleaner can be accomplished by motive force generated by the user.

[0004] A commercially available portable extraction cleaning device known as the BISSELL Little Green Clean Machine Model 1400, 1425, or 1425-1 incorporates a fluid distribution and recovery system similar to a larger extraction device in a smaller configuration.

Summary of Invention

[0005] According to the invention, an unattended spot cleaning apparatus comprises an enclosure, a base, a fluid distribution system, a fluid recovery system, an agitation system, a rack drive mechanism, floor condition sensors and a power distribution system. The fluid distribution system is mounted to the base to selectively apply cleaning solution to the surface being cleaned. The fluid distribution system may also include a heater to raise the solution temperature to a point less than boiling. The fluid recovery system is mounted to the base to remove loose debris and liquid from the surface being cleaned. The agitation system comprises an agitation device mounted to the base for agitating debris at the surface. A fluid distribution manifold, a suction manifold and an agitation device are mounted to a drive mechanism which moves the mechanism within an aperture formed in the base. The unattended spot cleaning apparatus is operated as an unattended device. The user prepares the apparatus by filling appropriate fluid distribution tanks and placing the unit over the area to be cleaned. Once properly positioned over the soiled area, the user need only apply power to the apparatus. The sensors on the apparatus detect the condition of the surface being cleaned and a logic board applies the proper combination of fluid distribution, fluid extraction and agitation according to inputs received from the sensors.

Brief Description of Drawings

[0006] In the drawings:

[0007] FIG. 1 is a perspective view of an unattended spot cleaning apparatus according to

the invention.

[0008] FIG. 2 is a perspective bottom view of the unattended spot cleaning apparatus shown in FIG. 1.

[0009] FIG. 3 is a schematic cross-sectional view of the fluid distribution system taken along line 3-3 of FIG. 1.

[0010] FIG. 4 is a schematic functional cross sectional view of the fluid recovery system taken along line 4-4 of FIG. 1.

[0011] FIG. 5 is an exploded view with a portion broken away of the unattended spot cleaning apparatus shown in FIG. 1.

[0012] FIG. 6 is an exploded view with a portion broken away of a second embodiment of the unattended spot cleaning apparatus according to the invention, showing a vibrating platen.

[0013] FIG. 7 is a cross sectional view of the platen taken along line 7-7 of FIG. 6.

[0014] FIG. 8 is a partial bottom view of the platen taken along line 8-8 of FIG. 6.

[0015] FIG. 9 is an exploded view of a third embodiment of an unattended spot cleaning apparatus according to the invention showing a differently shaped enclosure and housing.

[0016] FIG. 10 is an exploded view of the nozzle brush assembly of the unattended spot cleaning apparatus of FIG. 9.

[0017] FIG. 11 is a view partly in cross section taken along line 11-11 of the nozzle brush assembly of FIG. 10.

[0018] FIG. 12 is a view partly in cross section taken along line 12-12 of the nozzle brush assembly of FIG. 10.

[0019] FIB. 13 is a bottom plan view of the unattended spot cleaning apparatus of FIG. 9.

Detailed Description

[0020] The invention is described as an unattended spot cleaner. A user identifies a

stained portion of a surface to be cleaned, e.g., a carpeted or upholstered surface, fills the spot cleaner with the necessary cleaning fluids, places the spot cleaner over the stain, and energizes the spot cleaner. The spot cleaner, without further intervention by the user, detects the condition of the surface to be cleaned, applies the appropriate cleaning fluids, agitates the spot as necessary, suctions excess cleaning fluids from the surface, and provides external status indications with respect to cleaning status. The user returns, at his or her convenience, to the spot cleaner, removes the spot cleaner from the surface to be cleaned, and manually empties excess fluid recovered during the cleaning process.

[0021] Referring to the figures, in particular FIGS. 1-5, an unattended spot cleaning apparatus 10 is described and comprises an enclosure 12, a base 14, a fluid distribution system 11, a fluid recovery system 17, an agitation system 19, a drive rack assembly 21, floor condition sensors 23 and a power distribution system 25. The enclosure 12 is preferably made of a transparent material for at least a portion of at least one side wall so that the surface to be cleaned is visible to the user. A U-shaped handle 13 is rotatably attached at opposing side walls of enclosure 12. Handle 13 is of sufficient size so that a space is formed between a bottom surface of handle 13 and a top surface of enclosure 12. Furthermore, handle 13 is shaped so that a top surface of the spot cleaning apparatus 10 is unobstructed when handle 13 is rotated to a horizontal position. A rack support structure 16 is mounted to a top surface of the base 14. The base 14 comprises a generally plate-like structure that forms a bottom for enclosure 12. A cleaning aperture 18 is formed within the base 14 and allows direct access of the internal components to the surface being cleaned. A plurality of cylindrical grippers 15 are located on a bottom surface of base 14. Alternatively, grippers 15 can be replaced with a commonly known hook portion of a hook and loop fastening system or any other device that tends to increase the friction between carpet and base and thus minimize relative movement between base 14 and the surface to cleaned.

[0022] The fluid distribution system 11 comprises a first solution tank 20 removably mounted to a top of the enclosure 12. A second solution tank 22 is removably mounted adjacent to the first solution tank 20 and also on the top surface of the enclosure 12. A first cap 24 is sealingly mated to an opening in the first solution tank

20. A second cap 26 is sealingly mated to an opening in second solution tank 22. The caps 24, 26 have a small aperture through the top to vent the respective tanks 20, 22. A recovery tank 28 is removably mounted to the top surface of the enclosure 12 and adjacent to first solution tank 20 and second solution tank 22. A recovery tank cap 30 is sealingly attached to an opening in recovery tank 28. An on/off switch 32 is directly accessible to the user on an outer surface of the enclosure 12. Referring to FIG. 2, a distribution manifold 34 is positioned within the cleaning aperture 18. An agitation brush 36 is mounted parallel to the distribution manifold 34. A suction nozzle 38 is located adjacent to the agitation brush 36. The distribution manifold 34, agitation brush 36 and suction nozzle 38 are mounted on rack support structure 16 and are movable laterally therewith and within the cleaning aperture 18.

[0023]

Referring to FIGS. 3 and 5, the fluid distribution system 11 further comprises a first solution tank 20 and a second solution tank 22. A first outlet valve 42 is located within an outlet opening of first tank 20. First outlet valve 42 is spring loaded in the closed position when first solution tank 20 is removed from the unit. A protrusion associated with the enclosure aligns with the first outlet valve and upon engagement overcomes the spring force creating an opening in fluid communication with a first conduit 44. An example of a suitable outlet valve is disclosed in U.S. Patent 6,467,122 to Lenkiewicz and is incorporated herein by reference in its entirety. First conduit 44 is in fluid communication with a mixing valve solenoid 46. Mixing valve solenoid 46 is electrically actuated and is capable of varying the flow mixture. A second outlet valve 48 is positioned in an outlet in second tank 22 in a fashion similar to that previously described for the first solution tank. The second outlet valve 48 is in fluid communication with a second conduit 50. The second end of second conduit 50 is in fluid communication with a separate inlet to the mixing valve solenoid 46. A single mixing valve outlet 52 allows mixed fluids from first solution tank 20 and second solution tank 22 to exit the mixing valve solenoid 46. An example of a suitable mixing valve is disclosed in U.S. Patent 6,131,237 to Kasper, which is incorporated herein by reference in its entirety. The mixing vale outlet 52 is in fluid communication with a solution solenoid valve 54. The solution solenoid valve 54 is electrically controlled to provide opening and closing of the fluid delivery conduit 56. The fluid delivery conduit is in fluid communication with spray nozzle 34. Spray nozzle 34 further comprises a

plurality of spray apertures 58 along a lower surface of spray nozzle 34. As can be appreciated, the size and number of solution tanks 20, 22 can vary. Furthermore, the tanks may be flexible, collapsible bladders as more fully described in 6,446,302 to Kasper et al. and is incorporated herein by reference in its entirety. All tanks contain outlets and conduits as previously described and all conduits are in fluid communication with mixing valve solenoid 46. A plurality of chemical compositions including, but not limited to, detergent, oxidizers, disinfectants, miticides, fragrances, protectants or other compounds may be used in the plurality of solution tanks.

[0024] Alternatively, a pump may be used to provide solution under pressure to the distribution manifold 34. One such example is found in U.S. Patent No. 6,446,302 to Kasper et al. as previously referenced.

[0025] In yet another alternative, the solution tanks 20, 22 may be pressurized with an aerosol propellant. The solution may be distributed through the previously described solution valve 54 or may utilize a separate delivery system. Optionally, a heater may be incorporated within the fluid distribution system to heat the solution prior to reaching the surface to be cleaned to a temperature less than boiling. One example of such a solution heater may be found in U.S. Patent No. 6,131,237 to Kasper et al., which is incorporated herein by reference in its entirety.

[0026] Referring to FIGS. 4 and 5, the fluid recovery system 17 further comprises the suction nozzle 38. Suction nozzle 38 has a relatively narrow width aperture in close proximity to the surface being cleaned. An outlet of the suction nozzle 38 is in fluid communication with a flexible suction conduit 60. A second end of the flexible conduit 60 is in fluid communication with an inlet standpipe 62. The inlet standpipe 62 extends within the interior surface of recovery tank 28. A gasket assembly seals the inlet standpipe to the suction conduit such that fluid communication is maintained when the recovery tank 28 is mounted to the top of enclosure 12. An outlet standpipe 64 is mounted within recovery tank 28 with a sealing gasket assembly similar to that described above for the inlet standpipe 62 such that fluid communication is maintained when the recovery tank 28 is mounted to the enclosure 12. Alternatively, the air inlet and outlet through the recovery tank 28 may be configured as shown in the commercially available Little Green Clean Machine Model 1400, Model 1425, or

Model 1425-1 portable extraction cleaner under the BISSELL brand name. A fan housing with an inlet and an outlet is mounted within the enclosure 12. A fan 66 is rotatably mounted within the fan housing. The inlet of the fan 66 is in fluid communication with the outlet of the outlet standpipe 64. The fan motor 68 is in communication with the fan 66. In the first embodiment, the motor 68 is an electrical motor. When power is applied to the fan motor 68 the motor turns a shaft that rotates the fan 66. As fan 66 rotates airflow is generated through the fan and the fan An exhaust aperture 70 is located on an outer surface of the enclosure 12 and is in fluid communication with the fan inlet 66.

[0027] The agitation system 19 comprises an agitation brush 36. In a first embodiment, the agitation brush 36 is a brush roll mounted in a horizontal position relative to the surface to be cleaned. A brush axle 72 is located on a centerline axis of the brush roll 36. A single axle 72 is located on both ends of the brush roll 36. The brush drive belt 74 rides on an outer surface of one of the brush axles 72. A brush motor 76 is located within the enclosure 12 in close proximity to the brush roll 36. A motor shaft 78 extends from the brush motor 76 and is in vertical alignment with one of the brush axles 72. Drive belt 74 is in contact with both the motor shaft 78 and the brush axle 72. Alternatively, a pulley may be fixedly attached to both the motor shaft 78 and the brush axle 72 to maintain belt position on the shaft 78 and axle 72. In the first embodiment, the brush drive motor 76 is an electrical motor. Power to the brush motor 76 energizes the motor to rotate the brush roll 36 through the shaft 78, the belt 74 and the axle 72. In a second embodiment, the brush motor 76 can be an air turbine motor driven by the vacuum created by the fluid recovery system.

[0028] Referring to FIG. 5, a rack drive assembly 21 comprises a rack support structure 16 and a drive rack 80. Opposing brush slots 82 extend through opposing side walls of the rack support structure 16 and provide a track on which the agitation brush 36 travels. More particularly, the brush axle 72 coincides with the brush slots 82. Each of a pair of drive screw bearings 84 is located on opposing walls of rack support structure 16 on sides adjacent to the brush slots 82. A rack drive motor support 86 is located directly above one of the drive screw bearings 84. The drive rack 80 further includes a generally U-shaped structure comprising a suction nozzle support 88 that is rigidly attached to suction nozzle 38. A pair of spray bar supports 90 is located on

side opposite the suction nozzle support 88. One end of the U-shaped drive rack 80 comprises a pair of apertures. The top aperture, a brush drive shaft bearing 92, is located directly above a second aperture brush axle bearing 94. The motor shaft 78 protrudes through the brush drive shaft bearing 92. The axle shaft 72 protrudes through brush axle bearing 94. A drive screw threaded aperture 96 is located on a centerline of the drive rack. Male threads on the drive screw threaded aperture 96 correspond with female threads on a drive screw 40. Drive screw 40 is threaded within the threaded aperture 96 for travel in an axial direction. A drive screw motor 98 is positioned upon rack drive motor support 86. One end of drive screw 40 protrudes through drive screw bearing 84. A drive screw motor shaft 100 extends from a centerline of drive screw motor 98. Drive screw shaft 100 is in vertical alignment with drive screw 40. Drive screw belt 102 is in communication with drive screw shaft 100 and drive screw 40. In the first embodiment, the drive screw motor 98 is an electrical motor. Drive screw motor 98 rotates upon application of power, causing shaft 100 to turn, which causes belt 102 to turn, which then causes drive screw 40 to turn. As drive screw 40 turns, drive rack 80 is caused to move along the length of drive screw 40 due to the interference between threaded aperture 96 and the threads on drive screw 40. When drive rack 80 reaches the end of the travel in one direction the female threads on the end of drive screw 40 are cut such that automatic reversal of drive rack occurs and drive rack 80 proceeds along the length of drive screw 40 in an opposite direction. Similar reversing screw thread designs are incorporated on both ends of the drive screw 40 such that so long as power is applied to the drive motor 98, drive rack 80 will continuously work its way back and forth along the length of drive screw 40. Alternatively, the logic board reverses polarity on the rack drive motor 98 to cause the rack 80 to reverse directions. The spray nozzle 34, agitation brush 36, and suction nozzle 38 also move in correlation with the drive rack 80.

[0029] In a second embodiment, the rack drive assembly 21 comprises a reversible motor mounted on the drive rack 80 and further comprising a spur gear fixedly attached to the motor shaft. The rack support structure comprises a gear rack on an upper wall that corresponds with the spur gear on the motor. The logic board sends electrical output to the reversible motor, which causes the rack drive assembly to move in a back and forth fashion across the rack support structure. In yet another embodiment,

gear racks are formed on the upper surface of two opposite sides of the rack support structure. A second spur gear is rotatably attached to a side of the rack support structure opposite the reversible motor.

[0030] Referring to FIGS. 2 and 5, a plurality of floor condition sensors 23 are located on an inside wall of rack support structure 16. The floor condition sensors 23 are located to scan the entire area within the cleaning aperture 18 and measure the relative degree of soil on the surface being cleaned by sensing color variation. A logic board 106 is located within the enclosure 12 and the base 14. The logic board 106 comprises a commonly known printed circuit board upon which commonly known computer processing and electronic components are mounted. Batteries 108 are also located in the cavity between the enclosure 12 and the base 14. The switch 32 selectively controls power from the batteries 108. When switch 32 is on, power flows to the logic board 106. The logic board 106 receives inputs from the various condition sensors 104 and provides conditioned output to any combination of the suction motor 68, brush drive motor 76, drive screw motor 98, the solution solenoid valve 54 or the mixing valve solenoid 46. The floor condition sensors 23 are mounted such that the entire area within the cleaning aperture 18 is monitored. Each sensor 23 provides signals relative to the condition of the surface being cleaned to the logic board 106 for processing. One such example of a logic board and floor condition sensors is disclosed in U.S. Patent No. 6,446,302 to Kasper et al. issued on September 10, 2002, as previously referenced. Alternatively, the logic board can utilize pre-timed programs in the fashion of a commonly known laundry washing machine timing circuit. In an alternate embodiment, logic board output signals are routed to a plurality of visual or audible indicators mounted to the exterior of the enclosure. Indicators can include Light Emitting Diodes (LED's) or signal tone generators. Indicators may convey information such as low solution, the present stage of the cleaning cycle, or the like.

[0031] The batteries 108 may be any commonly known battery source including alkaline or rechargeable nickel cadmium, nickel metal hydride or lithium metal hydride. When rechargeable batteries are used, a commonly known recharging circuit is used to transform commonly available facility voltage to a level suitable for the batteries 108. A charging plug connected to the transformer is manually or automatically attached to the corresponding jack connected to the batteries 108 thereby completing the circuit

and allowing the batteries to charge. An example of such a recharging circuit may be found in the commercially available rechargeable stick vacuum sold by BISSELL Homecare, Inc. under the name GoVac. In an alternate embodiment, the rechargeable batteries are eliminated and a direct wire to the facility outlet is supplied. In this configuration, on/off switch 32 is used to control power from the facility to the logic board.

[0032]

In operation, the user connects the unattended spot cleaning apparatus 10 to facility power to energize the power circuit. Once a full charge on the batteries 108 is achieved, the user removes the charging circuit from the unattended spot cleaning apparatus 10. Typically, the user fills first solution tank 20 with clean water and the other solution tanks with some type of detergent, protectant, miticide or any other application that is desired on the surface to be cleaned. The user visually scans the surface to be cleaned and determines the particular location in which cleaning is desired. The user places the unattended spot cleaning apparatus 10 over the spot to be cleaned. For spots that fit within the perimeter of aperture 18, a one-time use is all that is required. For spots larger than the perimeter of aperture 18, the steps described below must be repeated by moving the apparatus 10 to the desired location for each succeeding cleaning. Once properly positioned, the on/off switch 32 is engaged and power is delivered to the logic board 106. The logic board 106 controls output based on information from the floor condition sensors 104. Typically, the drive rack assembly 80 will make a number of passes over the area to be cleaned while the condition sensors 104 monitor the condition of the surface to be cleaned. Depending on the condition of the floor being cleaned, the logic board will generate signals to the various drive components. A typical sequence is as follows: mixing valve solenoid 46 will be adjusted to provided the proper mixture of clean water in first solution tank 20 and detergent or other secondary solution contained in the other solution tanks; solution solenoid valve 54 will be opened allowing mixed solution to flow under force of gravity to the spray bar 34; mixed solution will then drip from the apertures on the bottom of solution bar 34 as solution bar passes over the area to be cleaned. Once floor condition sensors 104 sense that adequate fluid has been deposited on the floor (or the end of the pre-timed cycle is complete), solution solenoid valve 54 will be shut off, thus preventing fluid from flowing to the surface to be cleaned. Logic board 106

will then send a drive signal to the brush motor 76 causing brush roll 36 to rotate. Drive rack assembly 80 will continue passing over the spot to be cleaned this time with agitation brush 36 rotating. Once condition sensors 104 sense adequate agitation of the surface being cleaned, the signal to brush motor 76 will be removed, thus causing the agitation brush roll 36 to stop rotation. Again, depending on signals delivered by the condition sensors 104 logic board 106 will then send an output signal to suction motor 68. As suction motor 68 turns, the fan will generate an airflow as depicted by the arrows in FIG. 4. Loose debris and liquid at the surface to be cleaned and within the proximity of the suction nozzle 38 will be lifted from the surface to be cleaned, carried through the suction conduit 60 through the inlet standpipe 62 and be deposited within the interior of the recovery tank 28. Separation of air, debris and liquid occurs within the interior of the recovery tank 28. Heavier solids and liquids fall to the bottom of the recovery tank 28. Working air is then drawn into the outlet standpipe 64 and into the fan inlet 66. Working air then passes through fan 66 and is exhausted through the exhaust aperture 70. Condition sensors 104 and logic board 106 continue to evaluate the condition of the surface being cleaned and selectively send signals as needed to the various drive components. Once the desired level of cleanliness is achieved (or the pre-timed cleaning cycle ends), power to all of the drive components is removed and the unattended spot cleaning apparatus reverts to an idle mode. Upon returning to the unattended spot cleaning apparatus 10, the user turns off the electrical switch 32, thus removing all power to the logic board. The user removes the recovery tank 28 from the enclosure 12 and debris from the recovery tank 28 is dumped into an appropriate disposal receptacle. Similarly, unused or excess solution in the first solution tank 20 and other solution tanks are disposed of as needed or may be stored in the tank for future use. The unattended spot cleaning apparatus 10 is reattached to the charging circuit to replenish power to the batteries 108.

[0033] Referring to FIGS. 6, 7, and 8, in a third embodiment, the agitation system 19 may be a perforated vibrating platen. A plate 71 comprises a top surface 73, a bottom surface 75, and a plurality of apertures 77 therethrough creating a perforated structure in constant contact with the surface to be cleaned within cleaning aperture 18. Referring to FIG. 8, apertures 77 comprise a smaller opening 79 on the top surface

73 and a larger opening 81 on the bottom surface 75 oriented in a concentric fashion. Referring to FIG. 7, concentric openings 73 and 75 are joined by an arcuate wall to create a bugle-shaped opening 77 through the plate 71. The larger openings 81 are located directly adjacent one another in order to minimize the bottom surface 75 and maximize the surface area of larger opening 81 in direct contact with the surface to be cleaned. Openings 77, therefore, create a plurality of smaller suction nozzles spaced across the plate 71. A vertical support rod 83 is fixedly attached to the top surface 73 in each of the four corners on the top surface 73 of the plate 71. Each vertical support rod 83 corresponds to a guide aperture 85 formed through a support bracket 87 affixed to an upper inside wall of the rack support structure 16. Three of the vertical support rods 83 are covered with a retaining cap 89 that serves to moveably secure the plate 71 to the rack support structure 16. The fourth support rod 83 is fixedly attached to a transmission 91. Transmission 91 is movably attached to a motor shaft, which in turn is affixed to a plate motor 93. Plate motor 93 is fixedly attached to an upper surface of the rack support structure. The transmission 91 converts rotational motion of the motor shaft into an orbital motion by the plate 71. High frequency vibrations are transmitted through the plate 71 to the surface to be cleaned resulting in debris separating from the surface. Loose debris can then be removed by fluid recovery system by creating a suction above the plate 71 and through the bugle-shaped apertures 73 as previously described. In one embodiment, the high frequency vibrations are ultrasonic.

[0034] In a fourth embodiment, the agitation system 19 is a sonic system that removes debris by directing sound waves to the surface to be cleaned at a specified frequency. The sound waves create vibrations that separate debris from the surface to be cleaned. The loosened debris can be removed as previously described. Referring to FIG. 9, in a fifth embodiment the unattended spot cleaner 200 further comprises an enclosure 202, a base 204, a fluid distribution system 211, a fluid recovery system 217 and an agitation system 219. Enclosure 202 further comprises a recess that accepts both the solution tank 218, and the recovery tank 232. Enclosure 202 further comprises a handgrip 206 located on an upper portion of enclosure 202. Enclosure 202 is preferably made of a transparent or translucent material so that the area within enclosure 202 is visible to the user from outside the unattended spot cleaner 200.

[0035] The fluid distribution system 217 further comprises a spray manifold 208, a solenoid valve 210, a pump 212, a pump gear 214, a solution conduit 216, and the solution tank 218. All of the components in the fluid distribution system are fluidly connected. The pump gear 214 meshes with a corresponding pinion gear 242 on a shaft extending from a fan motor assembly 240. The pump gear 214 corresponds with the pump 212 via a shaft. The solenoid valve 210 is electrically connected to the printed circuit board 241 for selectively distributing fluid to the spray manifold 208 as previously described in the first embodiment.

[0036] The fluid recovery system 217 further comprises a nozzle brush assembly 220 in fluid communication with a first conduit 222. A nozzle gear 224 is fixedly attached to an exterior surface of first conduit 222. A sealing slip ring 228 is attached to a second end of first conduit 222 opposite nozzle brush assembly 220. Slip ring 228 sealingly mates with a second conduit 230 such that rotating motion between first conduit 222 and second conduit 230 may occur but motion along a longitudinal axis of first conduit 222 and second conduit 230 is minimized. Second conduit 230 is in fluid communication with recovery tank 232, specifically at a recovery tank inlet 234 sealingly formed at an aperture through an outer wall of recovery tank 232. A third conduit 238 is in fluid communication with a recovery tank outlet 236 sealingly formed at an aperture through a sidewall of recovery tank 232. Third conduit 238 is in fluid communication with motor fan assembly 240. A suction solenoid valve 239 selectively blocks airflow through third conduit 238 on command from a printed circuit board 241 as previously described in the first embodiment. A motor shaft extends through a fan portion of motor fan assembly 240 and further comprises a motor pinion gear 242. A gear reduction assembly comprises a shaft 244 upon which a first reduction gear 246 is attached to one end of shaft 244 and a second reduction gear 248 is attached to the other end of shaft 244. In the assembly, motor pinion gear 242 is in constant communication with first reduction gear 246 and second reduction gear 248 is in constant communication with nozzle gear 244.

[0037] Referring to FIGS. 10 and 11, the nozzle brush assembly 220 further comprises a nozzle housing 250, a brush housing 252, and a plurality of bristle brushes 254. A T-shaped brush drive shaft 256 is fixedly attached to an inner surface of second conduit 230 and extends through first conduit 222, nozzle housing 250 and brush housing

252. A drive gear 258 is fixedly attached to the opposite end of shaft 256 and further comprises a plurality of teeth on the outer perimeter thereof. Bristle brush 254 further comprises a brush gear 260, a centrally located protrusion 255 on an upper face of brush gear 260 and a plurality of bristles 261 attached to a lower surface of brush gear 260. Protrusions 255 on brush gear 260 extend through corresponding apertures 257 in brush housing 252 and are staked, capped, or otherwise suitably attached to brush housing 252 so that the bristle brush 254 is captured by the brush housing 252 and are allowed to rotate freely within aperture 257. Bristle brushes 254 are spaced along brush housing 252 so that brush gears 260 remain in contact and intermesh with one another. Drive gear 258 is stationary and also intermeshes with the brush gear 260 of the inner most bristle brushes 254.

[0038] Nozzle housing 250 nests over brush housing 252 such that an inner wall of nozzle housing 250 remains in spaced relation to an outer wall of brush housing 252 thus creating a suction nozzle plenum 262. Suction nozzle plenum 262 is in fluid communication with an inner surface of first conduit 222 forming a part of a working air conduit that is in fluid communication with motor fan assembly 240. Referring to FIGS. 11 and 13, when power is applied to motor fan assembly 240 the motor shaft rotates causing motor pinion 242 to rotate. Motor pinion 242 is intermeshed with gear teeth of first reduction gear 246 that in turn causes second reduction gear 248 rotate via the shaft 244. The gear teeth of second reduction gear 248 intermesh with the gear teeth of nozzle gear 224. Since nozzle gear 224 is fixedly attached to first conduit 222 and first conduit 222 is fixedly attached to nozzle housing 250, the entire nozzle brush assembly 220 rotates about an axis formed by brush drive shaft 256. Since brush drive shaft 256 and drive gear 258 are fixed, the inner brush gears 260 that intermesh with drive gear 258 are also caused to rotate. Intermeshing of the outer brush gears 260 with the inner brush gears 260 create a counter rotation as more clearly shown in FIG. 13 by arrows. Thus, as nozzle brush assembly 220 rotates in a counterclockwise direction, inner brush gears 260 are caused to rotate in counterclockwise direction and outer brush gears 260 are caused to rotate in clockwise direction.

[0039] Referring again to FIG. 9, a plurality of floor condition sensors 263 are mounted to an interior surface of base 204 and operate in the same manner as described for the

preferred invention. A cord reel assembly 264 is mounted within enclosure 202 and further comprises a spring-loaded reel that retracts a power cord about an internal drum. Power cord interfaces with facility electrical outlet and provides electrical power to a switch 268 located on an upper surface of enclosure 202. Switch 268 interrupts power to printed circuit board 241. Printed circuit board 241 operates as previously described in the first embodiment.

[0040] The preferred invention has been described as an unattended spot cleaning apparatus. It can also be appreciated that several subsets of the invention may be recombined in new ways to provided various configurations. Any combination of a floor condition sensor system, fluid distribution system, fluid recovery system or agitation system may be used to create an invention to solve specific cleaning problems not requiring all the capabilities of all the subsystems herein described.

[0041] While the invention has been specifically described in connection with certain specific embodiments thereof, it is to be understood that this is by way of illustration and not of limitation. Reasonable variation and modification are possible within the scope of the forgoing description and drawings without departing from the scope of the invention that is described in the appended claims.

Claims

[c1] An unattended spot cleaning apparatus comprising;

a) a housing;

b) a base comprising an aperture in communication with housing;

c) a fluid distribution system within the housing for depositing fluid on the surface to be cleaned comprising;

- an at least one solution tank;

- a distribution manifold in fluid communication with the at least one solution tank;

d) a fluid recovery system within the housing for removing solids and liquids from the surface to be cleaned comprising;

- a suction source to generate a flow of working air;

- a fluid recovery tank;

- a suction nozzle in fluid communication with recovery tank;

e) a rack assembly on the base for movement within base aperture, said spray nozzle and said suction nozzle in communication with said rack assembly;

f) whereby said spray nozzle and said suction nozzle move within said aperture relative to said base and said housing.

[c2] The unattended spot cleaning apparatus of claim 1 and further including an agitation device mounted to the rack assembly.

[c3] The unattended spot cleaning apparatus of claim 2 wherein the agitation device is a brush.

[c4] The unattended spot cleaning apparatus of claim 3 wherein the agitation device is a rotating brush.

[c5] The unattended spot cleaning apparatus of claim 1 wherein the agitation device is fixed upon and moves with said rack assembly.

Unattended Spot Cleaning Apparatus

Abstract of Disclosure

A unattended spot cleaning apparatus comprises a housing, a fluid distribution system, a fluid recovery system, an agitation system, and a logic system to automatically monitor and control inputs and outputs to said systems. A suction nozzle and agitation device are mounted to the housing for movement over a surface to be cleaned relative to the housing.

Figures

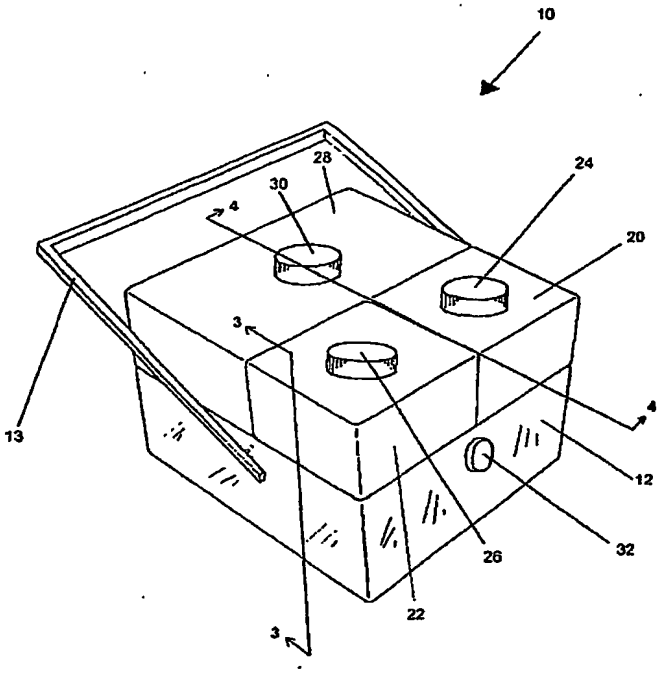

FIG. 1

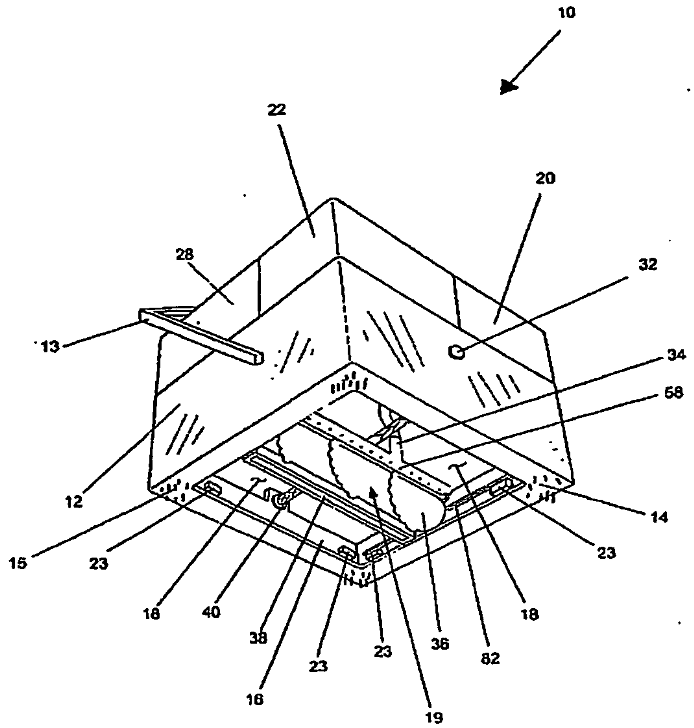

FIG. 2

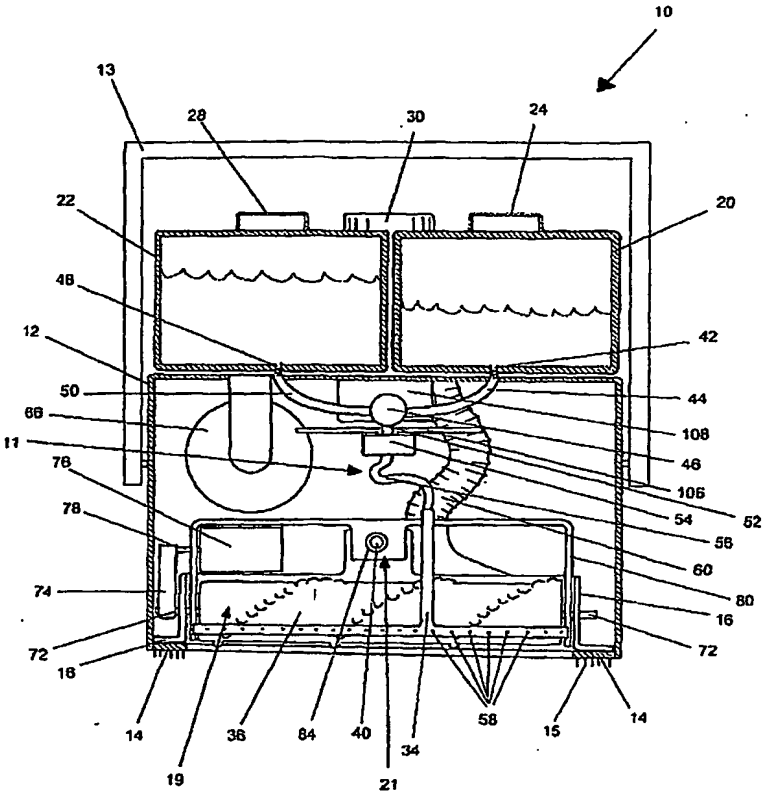
10
13
28
30
24
22
20
48
12
42
50
44
66
108
11
46
76
106
78
54
52
56
60
74
80
16
72
72
18
14
36
84
40
34
58
15
14
19
21

FIG. 3

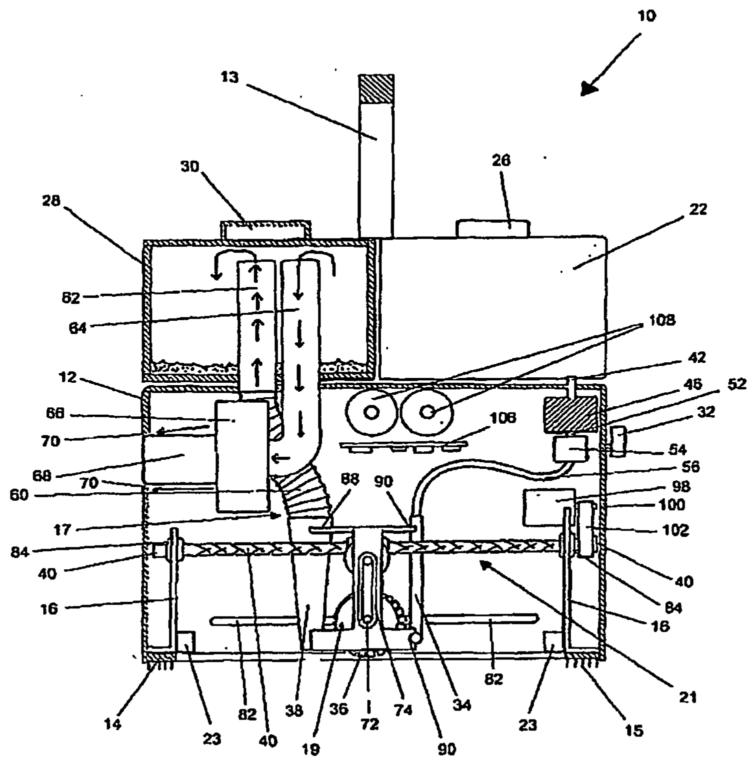
10
13
30
26
28
22
62
64
108
42
12
46
52
66
106
32
70
54
68
56
70
88
90
98
60
100
17
102
84
40
40
84
16
16
82
21
14
23
82
38
36
74
34
23
15
72
40
19
90

FIG. 4

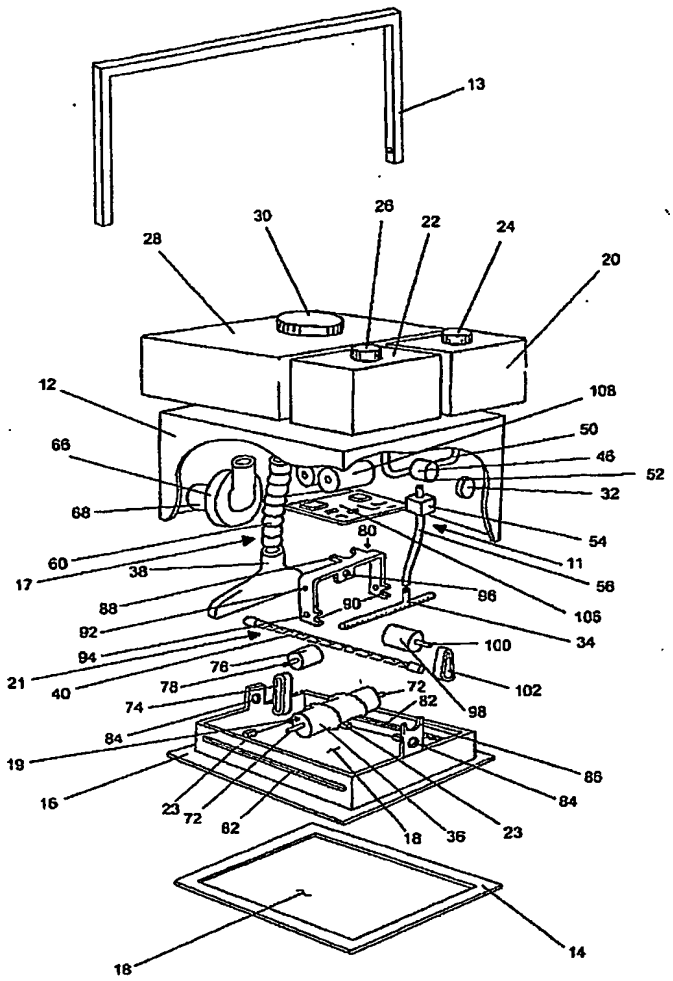
13
30
28
22
24
28
20
12
108
50
66
46
52
32
68
54
80
60
11
38
17
56
88
86
90
106
92
34
94
100
21
76
102
40
78
72
74
82
98
84
19
86
16
84
23
72
82
18
36
23
18
14

FIG. 5

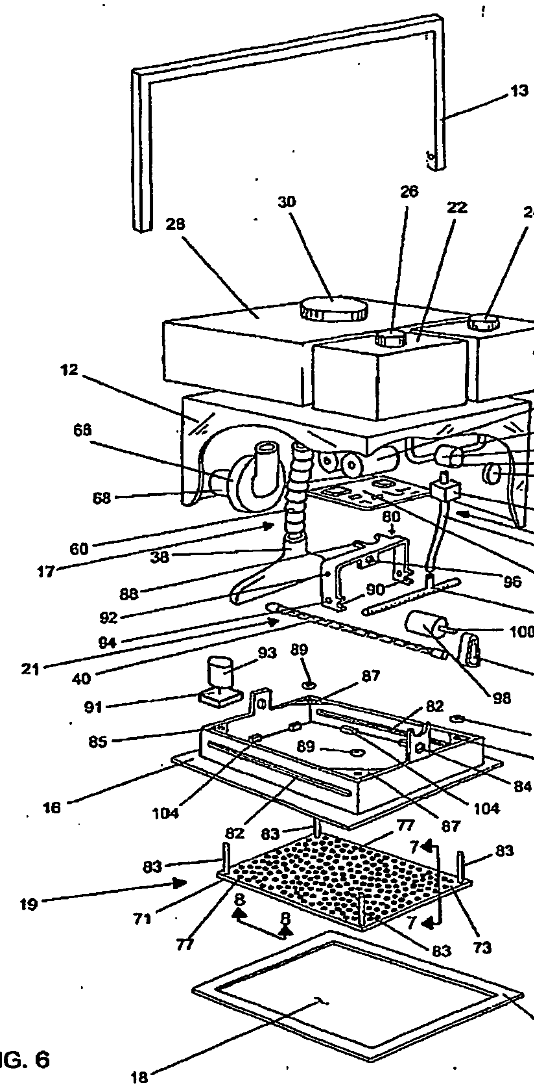

FIG. 6

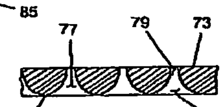

FIG. 7

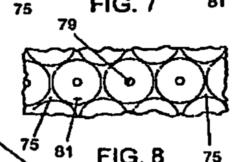

FIG. 8

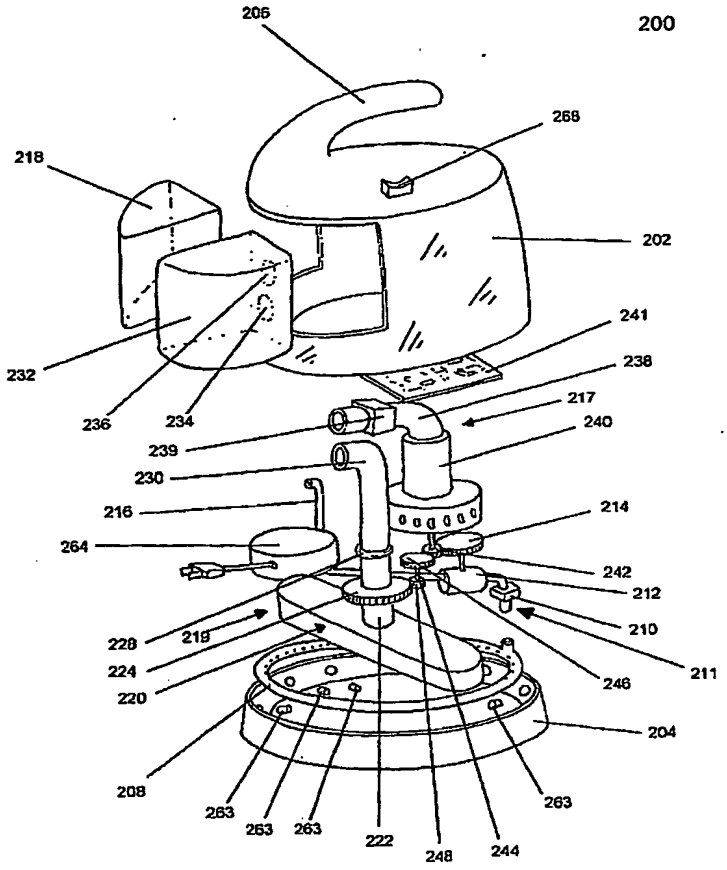
200
206
268
218
202
241
238
232
217
236
234
240
239
230
216
214
264
242
212
210
228
219
211
224
248
220
204
208
263
263
263
263
222
248
244
263

FIG. 9

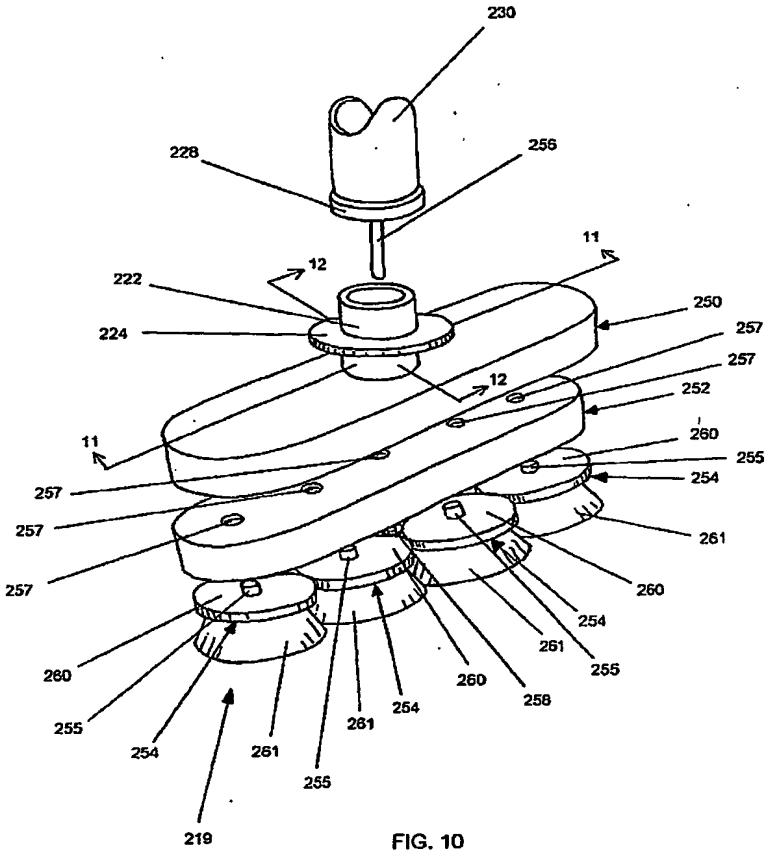
230
228
256
11
12
222
224
250
257
257
252
12
11
260
255
254
257
257
257
261
260
254
261
255
260
258
260
255
254
261
254
261
255
219

FIG. 10

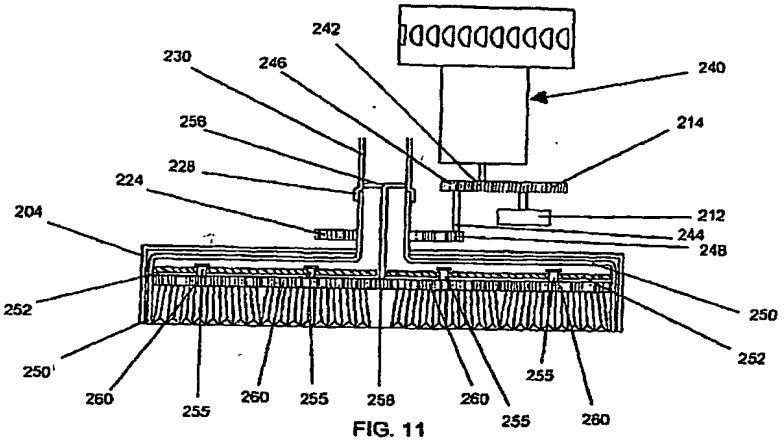
242
230
246
240
256
214
228
224
212
204
244
248
252
250
250'
252
260
255
260
255
258
260
255
260
255

FIG. 11

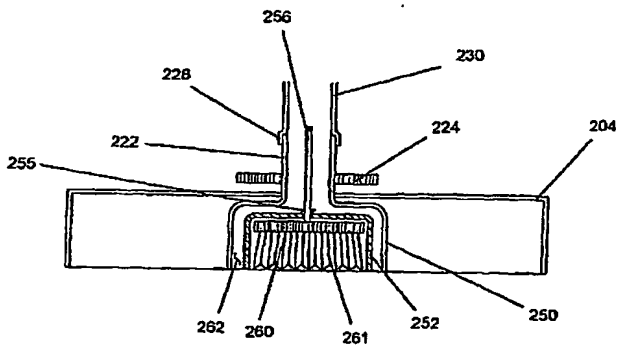
256
230
228
224
222
204
255
262
260
261
252
250

FIG. 12

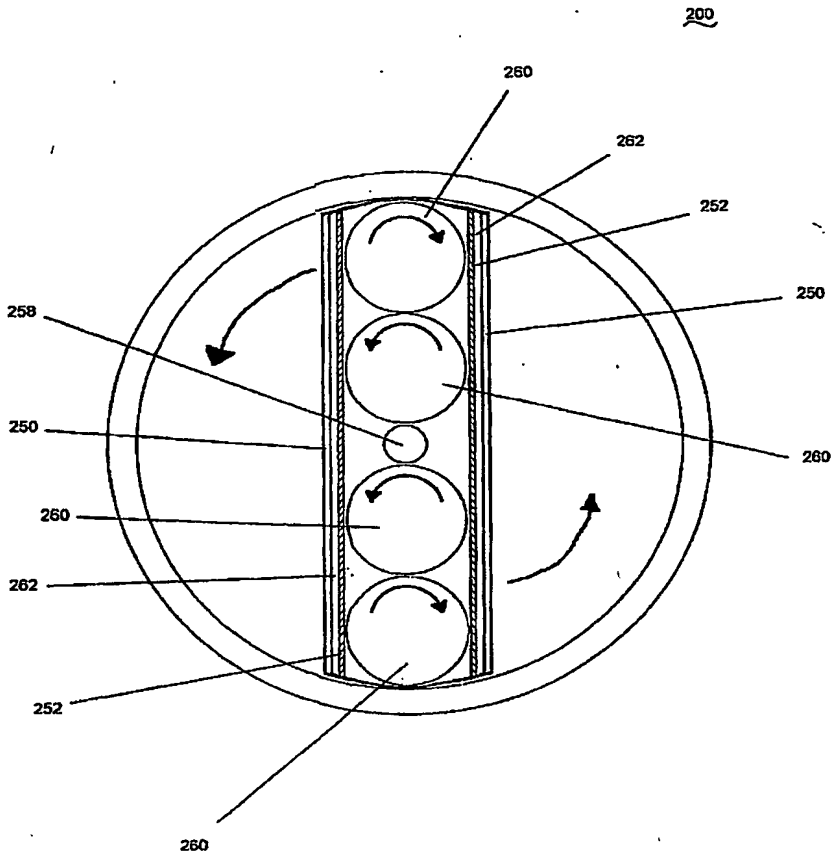

FIG. 13

This Page is Inserted by IFW Indexing and Scanning Operations and is not part of the Official Record

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☑ BLACK BORDERS
- ☐ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☐ FADED TEXT OR DRAWING
- ☑ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☐ SKEWED/SLANTED IMAGES
- ☐ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☐ LINES OR MARKS ON ORIGINAL DOCUMENT
- ☐ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: _____

IMAGES ARE BEST AVAILABLE COPY.
As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.